Project – Big Data And Spark

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Market Analysis in Banking Domain

DESCRIPTION

Background and Objective:

Your client, a Portuguese banking institution, ran a marketing campaign to convince potential customers to invest in a bank term deposit scheme.
The marketing campaigns were based on phone calls. Often, the same customer was contacted more than once through phone, in order to assess if they would want to subscribe to the bank term deposit or not. You have to perform the marketing analysis of the data generated by this campaign.

Domain: Banking (Market Analysis)

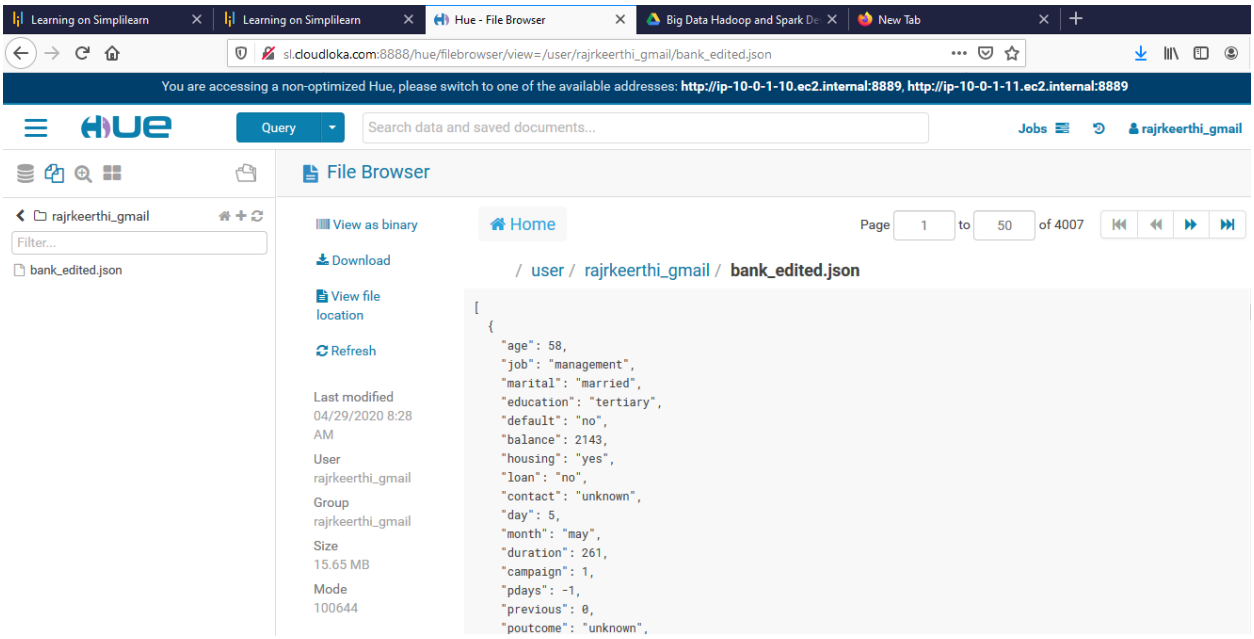
Analysis tasks to be done-:

- The data size is huge and the marketing team has asked you to perform the below analysis-
- Load data and create a Spark data frame
- Give the maximum, mean, and minimum age of the average targeted customer
- Check the quality of customers by checking average balance, median balance of customers
- Check if age matters in marketing subscription for deposit
- Check if marital status mattered for a subscription to deposit
- Check if age and marital status together mattered for a subscription to deposit scheme
- Do feature engineering for the bank and find the right age effect on the campaign.

Code and Outputs

Dataset

Uploaded json file



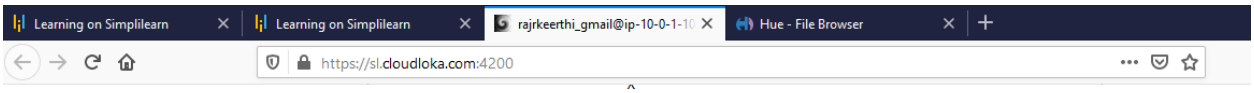
Web Console

Code

val bank_people_data=spark.read.option("multiline","true").json("/user/rajrkeerthi_gmail/bank_edited.json");

bank_people_data.show()

Output




```
scala> val bank_people_data = spark.read.option("multiline","true").json("/user/rajrkeerthi_gmail/bank_edited.json");
bank_people_data: org.apache.spark.sql.DataFrame = [age: bigint, balance: bigint ... 15 more fields]

scala> w()
+---+-------+--------+-------+---+-------+--------+---------+-------+------------+----+--------+-----+-----+--------+--------+---+
|age|balance|campaign|contact|day|default|duration|education|housing|         job|loan| marital|month|pdays|poutcome|previous|  y|
+---+-------+--------+-------+---+-------+--------+---------+-------+------------+----+--------+-----+-----+--------+--------+---+
| 58|   2143|       1|unknown|  5|     no|     261| tertiary|    yes|  management|  no| married|  may|   -1| unknown|       0| no|
| 44|     29|       1|unknown|  5|     no|     151|secondary|    yes|  technician|  no|  single|  may|   -1| unknown|       0| no|
| 33|      2|       1|unknown|  5|     no|      76|secondary|    yes|entrepreneur| yes| married|  may|   -1| unknown|       0| no|
| 47|   1506|       1|unknown|  5|     no|      92|  unknown|    yes| blue-collar|  no| married|  may|   -1| unknown|       0| no|
| 33|      1|       1|unknown|  5|     no|     198|  unknown|     no|     unknown|  no|  single|  may|   -1| unknown|       0| no|
| 35|    231|       1|unknown|  5|     no|     139| tertiary|    yes|  management|  no| married|  may|   -1| unknown|       0| no|
| 28|    447|       1|unknown|  5|     no|     217| tertiary|    yes|  management| yes|  single|  may|   -1| unknown|       0| no|
| 42|      2|       1|unknown|  5|    yes|     380| tertiary|    yes|entrepreneur|  no|divorced|  may|   -1| unknown|       0| no|
| 58|    121|       1|unknown|  5|     no|      50|  primary|    yes|     retired|  no| married|  may|   -1| unknown|       0| no|
| 43|    593|       1|unknown|  5|     no|      55|secondary|    yes|  technician|  no|  single|  may|   -1| unknown|       0| no|
| 41|    270|       1|unknown|  5|     no|     222|secondary|    yes|      admin.|  no|divorced|  may|   -1| unknown|       0| no|
| 29|    390|       1|unknown|  5|     no|     137|secondary|    yes|      admin.|  no|  single|  may|   -1| unknown|       0| no|
| 53|      6|       1|unknown|  5|     no|     517|secondary|    yes|  technician|  no| married|  may|   -1| unknown|       0| no|
| 58|     71|       1|unknown|  5|     no|      71|  unknown|    yes|  technician|  no| married|  may|   -1| unknown|       0| no|
| 57|    162|       1|unknown|  5|     no|     174|secondary|    yes|    services|  no| married|  may|   -1| unknown|       0| no|
| 51|    229|       1|unknown|  5|     no|     353|  primary|    yes|     retired|  no| married|  may|   -1| unknown|       0| no|
| 45|     13|       1|unknown|  5|     no|      98|  unknown|    yes|      admin.|  no|  single|  may|   -1| unknown|       0| no|
| 57|     52|       1|unknown|  5|     no|      38|  primary|    yes| blue-collar|  no| married|  may|   -1| unknown|       0| no|
| 60|     60|       1|unknown|  5|     no|     219|  primary|    yes|     retired|  no| married|  may|   -1| unknown|       0| no|
| 33|      0|       1|unknown|  5|     no|      54|secondary|    yes|    services|  no| married|  may|   -1| unknown|       0| no|
+---+-------+--------+-------+---+-------+--------+---------+-------+------------+----+--------+-----+-----+--------+--------+---+
only showing top 20 rows
```

Code

bank_people_data.select(max($"age")).show()

bank_people_data.select(min($"age")).show()

bank_people_data.select(avg($"age")).show()

bank_people_data.select(avg($"balance")).show()

Output

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```
scala> bank_people_data.select(max($"age")).show()
+--------+
|max(age)|
+--------+
|      95|
+--------+


scala> bank_people_data.select(min($"age")).show()
+--------+
|min(age)|
+--------+
|      18|
+--------+


scala> bank_people_data.select(avg($"age")).show()
+-----------------+
|         avg(age)|
+-----------------+
|40.93621021432837|
+-----------------+


scala> bank_people_data.select(avg($"balance")).show()
+------------------+
|      avg(balance)|
+------------------+
|1362.2720576850766|
+------------------+
```

Code

val median = spark.sql("SELECT percentile_approx(balance, 0.5) FROM datanewtable").show()

Output

```
scala> val median = spark.sql("SELECT percentile_approx(balance, 0.5) FROM datanewtable").show()
+-----------------------------------------------------+
|percentile_approx(balance, CAST(0.5 AS DOUBLE), 10000)|
+-----------------------------------------------------+
|                                                  448|
+-----------------------------------------------------+

median: Unit = ()
```

Code

val agedata = spark.sql("select age, count(*) as number from datanewtable where y='yes' group by age order by number desc")

agedata.show()

Output

```
scala> val agedata = spark.sql("select age, count(*) as number from datanewtable where y='yes' group by age order by number desc")
agedata: org.apache.spark.sql.DataFrame = [age: bigint, number: bigint]

scala> agedata.show()
+---+------+
|age|number|
+---+------+
| 32|   221|
| 30|   217|
| 33|   210|
| 35|   209|
| 31|   206|
| 34|   198|
| 36|   195|
| 29|   171|
| 37|   170|
| 28|   162|
| 38|   144|
| 39|   143|
| 27|   141|
| 26|   134|
| 41|   120|
| 46|   118|
| 40|   116|
| 25|   113|
| 47|   113|
| 42|   111|
+---+------+
only showing top 20 rows
```

Code

val maritaldata = spark.sql("select marital, count(*) as number from datanewtable where y='yes' group by marital order by number desc")

maritaldata.show()

Output

```
scala> val maritaldata = spark.sql("select marital, count(*) as number from datanewtable where y='yes' group by marital order by number desc")
maritaldata: org.apache.spark.sql.DataFrame = [marital: string, number: bigint]

scala> maritaldata.show()
+--------+------+
| marital|number|
+--------+------+
| married|  2755|
|  single|  1912|
|divorced|   622|
+--------+------+
```

Code

val ageandmaritaldata = spark.sql("select age, marital, count(*) as number from datanewtable where y='yes' group by age,marital order by number desc")

ageandmaritaldata.show()

Output

```
scala> val ageandmaritaldata = spark.sql("select age, marital, count(*) as number from datanewtable where y='yes' group by age,marital order by numbe
r desc")
ageandmaritaldata: org.apache.spark.sql.DataFrame = [age: bigint, marital: string ... 1 more field]

scala> ageandmaritaldata.show()
+---+-------+------+
|age|marital|number|
+---+-------+------+
| 30| single|   151|
| 28| single|   138|
| 29| single|   133|
| 32| single|   124|
| 26| single|   121|
| 34|married|   118|
| 31| single|   111|
| 27| single|   110|
| 35|married|   101|
| 36|married|   100|
| 25| single|    99|
| 37|married|    98|
| 33|married|    97|
| 33| single|    97|
| 32|married|    87|
| 39|married|    87|
| 38|married|    86|
| 35| single|    84|
| 47|married|    83|
| 31|married|    80|
+---+-------+------+
only showing top 20 rows
```

Code

val agedata = spark.udf.register("agedata",(age:Int) => {

if (age < 20)

"Teen"

else if (age > 20 && age <= 32)

"Young"

else if (age > 33 && age <= 55)

"Middle Aged"

else

"old"

})

val banknewDF = bank_people_data.withColumn("age",agedata(bank_people_data("age")))

banknewDF.show()

Output

```
scala> val agedata = spark.udf.register("agedata",(age:Int) => {
     | if (age < 20)
     |
     | "Teen"
     | else if (age > 20 && age <= 32)
     | "Young"
     | else if (age > 33 && age <= 55)
     | "Middle Aged"
     | else
     | "old"
     | })
```

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```
scala> val banknewDF = bank_people_data.withColumn("age",agedata(bank_people_data("age")))
banknewDF: org.apache.spark.sql.DataFrame = [age: string, balance: bigint ... 15 more fields]

scala> banknewDF.show()
+-----------+-------+--------+-------+---+-------+--------+---------+-------+------------+----+--------+-----+-----+--------+--------+---+
|        age|balance|campaign|contact|day|default|duration|education|housing|         job|loan| marital|month|pdays|poutcome|previous|  y|
+-----------+-------+--------+-------+---+-------+--------+---------+-------+------------+----+--------+-----+-----+--------+--------+---+
|        old|   2143|       1|unknown|  5|     no|     261| tertiary|    yes|  management|  no| married|  may|   -1| unknown|       0| no|
|Middle Aged|     29|       1|unknown|  5|     no|     151|secondary|    yes|  technician|  no|  single|  may|   -1| unknown|       0| no|
|        old|      2|       1|unknown|  5|     no|      76|secondary|    yes|entrepreneur| yes| married|  may|   -1| unknown|       0| no|
|Middle Aged|   1506|       1|unknown|  5|     no|      92|  unknown|    yes| blue-collar|  no| married|  may|   -1| unknown|       0| no|
|        old|      1|       1|unknown|  5|     no|     198|  unknown|     no|     unknown|  no|  single|  may|   -1| unknown|       0| no|
|Middle Aged|    231|       1|unknown|  5|     no|     139| tertiary|    yes|  management|  no| married|  may|   -1| unknown|       0| no|
|      Young|    447|       1|unknown|  5|     no|     217| tertiary|    yes|  management| yes|  single|  may|   -1| unknown|       0| no|
|Middle Aged|      2|       1|unknown|  5|    yes|     380| tertiary|    yes|entrepreneur|  no|divorced|  may|   -1| unknown|       0| no|
|        old|    121|       1|unknown|  5|     no|      50|  primary|    yes|     retired|  no| married|  may|   -1| unknown|       0| no|
|Middle Aged|    593|       1|unknown|  5|     no|      55|secondary|    yes|  technician|  no|  single|  may|   -1| unknown|       0| no|
|Middle Aged|    270|       1|unknown|  5|     no|     222|secondary|    yes|      admin.|  no|divorced|  may|   -1| unknown|       0| no|
|      Young|    390|       1|unknown|  5|     no|     137|secondary|    yes|      admin.|  no|  single|  may|   -1| unknown|       0| no|
|Middle Aged|      6|       1|unknown|  5|     no|     517|secondary|    yes|  technician|  no| married|  may|   -1| unknown|       0| no|
|        old|     71|       1|unknown|  5|     no|      71|  unknown|    yes|  technician|  no| married|  may|   -1| unknown|       0| no|
|        old|    162|       1|unknown|  5|     no|     174|secondary|    yes|    services|  no| married|  may|   -1| unknown|       0| no|
|Middle Aged|    229|       1|unknown|  5|     no|     353|  primary|    yes|     retired|  no| married|  may|   -1| unknown|       0| no|
|Middle Aged|     13|       1|unknown|  5|     no|      98|  unknown|    yes|      admin.|  no|  single|  may|   -1| unknown|       0| no|
|        old|     52|       1|unknown|  5|     no|      38|  primary|    yes| blue-collar|  no| married|  may|   -1| unknown|       0| no|
|        old|     60|       1|unknown|  5|     no|     219|  primary|    yes|     retired|  no| married|  may|   -1| unknown|       0| no|
|        old|      0|       1|unknown|  5|     no|      54|secondary|    yes|    services|  no| married|  may|   -1| unknown|       0| no|
+-----------+-------+--------+-------+---+-------+--------+---------+-------+------------+----+--------+-----+-----+--------+--------+---+
only showing top 20 rows
```

Code

val targetage = spark.sql("select age, count(*) as number from banknewtable where y='yes' group by age order by number desc")

targetage.show()

val agedata2 = new StringIndexer().setInputCol("age").setOutputCol("ageindex")

var strindModel = agedata2.fit(banknewDF)

strindModel.transform(banknewDF).select("age","ageIndex").show(5)

Output

```
scala> val targetage = spark.sql("select age, count(*) as number from banknewtable where y='yes' group by age order by number desc")
targetage: org.apache.spark.sql.DataFrame = [age: string, number: bigint]

scala> targetage.show()
+-----------+------+
|        age|number|
+-----------+------+
|Middle Aged|  2601|
|      Young|  1539|
|        old|  1131|
|       Teen|    18|
+-----------+------+


scala> val agedata2 = new StringIndexer().setInputCol("age").setOutputCol("ageindex")
agedata2: org.apache.spark.ml.feature.StringIndexer = strIdx_0f0538055cfc

scala> var strindModel = agedata2.fit(banknewDF)
strindModel: org.apache.spark.ml.feature.StringIndexerModel = strIdx_0f0538055cfc

scala> strindModel.transform(banknewDF).select("age","ageIndex").show(5)
+-----------+--------+
|        age|ageIndex|
+-----------+--------+
|        old|     2.0|
|Middle Aged|     0.0|
|        old|     2.0|
|Middle Aged|     0.0|
|        old|     2.0|
+-----------+--------+
only showing top 5 rows
```